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# PRESENTATION OF SALIENT FEATURES

# IN A PAGE TO A VISUALLY IMPAIRED USER

## BACKGROUND OF THE INVENTION

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### 1.    Technical Field:

The present invention relates generally to an improved data processing system, and in particular to a method, apparatus, and computer program for presenting
10   data.  Still more particularly, the present invention provides a method, apparatus, and computer program for presenting data to a visually impaired user.

### 2.    Description of Related Art:

15      The Internet, also referred to as an "internetwork", is a set of computer networks, possibly dissimilar, joined together by means of gateways that handle data transfer and the conversion of messages from the protocols of the sending network to the protocols used by the receiving
20   network (with packets if necessary).  When capitalized, the term "Internet" refers to the collection of networks and gateways that use the TCP/IP suite of protocols.

The Internet has become a cultural fixture as a source of both information and entertainment.  Many
25   businesses are creating Internet sites as an integral part of their marketing efforts, informing consumers of the products or services offered by the business or providing other information seeking to engender brand loyalty.  Many federal, state, and local government agencies are also
30   employing Internet sites for informational purposes, particularly agencies which must interact with virtually all segments of society such as the Internal Revenue

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Service and secretaries of state. Providing informational
guides and/or searchable databases of online public
records may reduce operating costs. Further, the Internet
is becoming increasingly popular as a medium for
5 commercial transactions.

  Currently, the most commonly employed method of
transferring data over the Internet is to employ the World
Wide Web environment, also called simply "the Web". Other
Internet resources exist for transferring information,
10 such as File Transfer Protocol (FTP) and Gopher, but have
not achieved the popularity of the Web. In the Web
environment, servers and clients effect data transaction
using the Hypertext Transfer Protocol (HTTP), a known
protocol for handling the transfer of various data files
15 (e.g., text, still graphic images, audio, motion video,
etc.). The information in various data files is
formatted for presentation to a user by a standard page
description language, the Hypertext Markup Language
(HTML). In addition to basic presentation formatting,
20 HTML allows developers to specify "links" to other Web
resources identified by a Uniform Resource Locator (URL).
A URL is a special syntax identifier defining a
communications path to specific information. Each logical
block of information accessible to a client, called a
25 "page" or a "Web page", is identified by a URL. The URL
provides a universal, consistent method for finding and
accessing this information, not necessarily for the user,
but mostly for the user's Web "browser". A browser is a
program capable of submitting a request for information
30 identified by an identifier, such as, for example, a URL.
A user may enter a domain name through a graphical user
interface (GUI) for the browser to access a source of
content. The domain name is automatically converted to

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the Internet Protocol (IP) address by a domain name system (DNS), which is a service that translates the symbolic name entered by the user into an IP address by looking up the domain name in a database.

5    Visually impaired users of the Web often rely on tools, such as a talking Web browser. An example of a talking Web browser is the Home Page Reader (HPR), which is available from International Business Machines Corporation (IBM). HPR is a spoken on-ramp to the

10   Information Highway for computer users who are blind or visually impaired. HPR provides Web access by quickly, easily, and efficiently speaking Web page information. HPR provides a simple, easy-to-use interface for navigating and manipulating Web page elements. Using the

15   keyboard to navigate, a user who is blind or who has a visual impairment can hear the full range of Web page content provided in a logical, clear, and understandable manner.

     In perceptual psychology, a notion of gestaltic

20   comprehension is present in which the perception is manifested by understanding the whole rather than analyzing small parts and combining them. For example, when a user views a Web page, a quick glance is all that it takes for the user to decide whether to read the Web

25   page. Often the quick glance is focused on the icons and/or pictures and some heavily enlarged or bolded headlines in the Web page. Unfortunately, with users who are blind, the gestaltic perception of the Web page is more difficult. Part of this difficulty occurs because

30   speech is more sequential than vision.

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The present invention recognizes that one problem with talking browsers is that an overview of the page is unavailable because this type of Web browser moves from topic to topic in a sequential manner.

5      Therefore, it would be advantageous to have an improved method, apparatus, and computer program for presenting a Web page to a user who may be visually impaired.

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## SUMMARY OF THE INVENTION

The present invention provides a method, apparatus, and computer program for presenting content in a document. The document is parsed for a salient feature and once a salient feature is located within the document, the salient feature is presented in a manner other than visually.

## BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The
5   invention itself, however, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

10        **Figure 1** is a pictorial representation of a network of data processing systems in which the present invention may be implemented;

        **Figure 2** is a block diagram of a data processing system that may be implemented as a server in accordance
15   with a preferred embodiment of the present invention;

        **Figure 3** is a block diagram illustrating a data processing system in which the present invention may be implemented;

        **Figure 4** is a block diagram of a browser program in
20   accordance with a preferred embodiment of the present invention;

        **Figure 5** is a diagram illustrating components used in presenting salient features of a document in accordance with a preferred embodiment of the present
25   invention;

        **Figure 6** is a flowchart of a process used for presenting a document to a visually impaired user in accordance with a preferred embodiment of the present invention; and

30        **Figure 7** is a a flowchart of a process used for transcoding a page in accordance with a preferred embodiment of the present invention.

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## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to the figures, **Figure 1** depicts a pictorial representation of a network of data processing
5  systems in which the present invention may be implemented. Network data processing system **100** is a network of computers in which the present invention may be implemented. Network data processing system **100** contains a network **102**, which is the medium used to provide
10  communications links between various devices and computers connected together within network data processing system **100**. Network **102** may include connections, such as wire, wireless communication links, or fiber optic cables.

In the depicted example, a server **104** is connected to
15  network **102** along with storage unit **106**. In addition, clients **108**, **110**, and **112** also are connected to network **102**. These clients **108**, **110**, and **112** may be, for example, personal computers or network computers. In the depicted example, server **104** provides data, such as boot files,
20  operating system images, and applications to clients **108-112**. Clients **108**, **110**, and **112** are clients to server **104**.

The mechanism of the present invention allows for a browser executing on a client, such as client **108** to
25  present sufficient portions of content within a document to a visually impaired user so that the visually impaired user is able to obtain an overview of the document. Salient features from a document are selected for presentation to the user. Salient features may include,
30  for example, bold text, italicized text, underlined text, text in a selected color, and text having a certain font size and/or text having a certain position within the

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document, such as a title, heading, first sentence, etc.
These features may be selected in a proxy or a server,
such as server **104** and sent via extensible markup language
(XML) tags or in resource description framework (RDF)

5 files to the browser at client **108**. Alternatively, the
mechanism of the present invention may be implemented at
client **108** to extract the salient features. When a new
page is sent to the user, the user is provided an option
as to whether salient features from the new page are to be

10 presented. If the salient features are presented to the
user, the user may choose whether the entire page is to be
presented.

Network data processing system **100** may include
additional servers, clients, and other devices not shown.

15 In the depicted example, network data processing system
**100** is the Internet with network **102** representing a
worldwide collection of networks and gateways that use the
TCP/IP suite of protocols to communicate with one another.
At the heart of the Internet is a backbone of high-speed

20 data communication lines between major nodes or host
computers, consisting of thousands of commercial,
government, educational and other computer systems that
route data and messages. Of course, network data
processing system **100** also may be implemented as a number

25 of different types of networks, such as for example, an
intranet, a local area network (LAN), or a wide area
network (WAN). **Figure 1** is intended as an example, and not
as an architectural limitation for the present invention.

Referring to **Figure 2**, a block diagram of a data

30 processing system that may be implemented as a server,
such as server **104** in **Figure 1**, is depicted in accordance
with a preferred embodiment of the present invention.

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Data processing system **200** may be a symmetric
multiprocessor (SMP) system including a plurality of
processors **202** and **204** connected to system bus **206**.
Alternatively, a single processor system may be employed.

5    Also connected to system bus **206** is memory
controller/cache **208**, which provides an interface to local
memory **209**. I/O bus bridge **210** is connected to system bus
**206** and provides an interface to I/O bus **212**. Memory
controller/cache **208** and I/O bus bridge **210** may be

10   integrated as depicted.

Peripheral component interconnect (PCI) bus bridge
**214** connected to I/O bus **212** provides an interface to PCI
local bus **216**. A number of modems may be connected to PCI
bus **216**. Typical PCI bus implementations will support

15   four PCI expansion slots or add-in connectors.
Communications links to network computers **108-112** in
**Figure 1** may be provided through modem **218** and network
adapter **220** connected to PCI local bus **216** through add-in
boards.

20   Additional PCI bus bridges **222** and **224** provide
interfaces for additional PCI buses **226** and **228**, from
which additional modems or network adapters may be
supported. In this manner, data processing system **200**
allows connections to multiple network computers. A

25   memory-mapped graphics adapter **230** and hard disk **232** may
also be connected to I/O bus **212** as depicted, either
directly or indirectly.

Those of ordinary skill in the art will appreciate
that the hardware depicted in **Figure 2** may vary. For

30   example, other peripheral devices, such as optical disk
drives and the like, also may be used in addition to or in
place of the hardware depicted. The depicted example is

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not meant to imply architectural limitations with respect to the present invention.

The data processing system depicted in **Figure 2** may be, for example, an IBM RISC/System 6000 system, a product
5  of International Business Machines Corporation in Armonk, New York, running the Advanced Interactive Executive (AIX) operating system.

With reference now to **Figure 3**, a block diagram illustrating a data processing system is depicted in which
10  the present invention may be implemented. Data processing system **300** is an example of a client computer. Data processing system **300** employs a peripheral component interconnect (PCI) local bus architecture. Although the depicted example employs a PCI bus, other bus
15  architectures such as Accelerated Graphics Port (AGP) and Industry Standard Architecture (ISA) may be used. Processor **302** and main memory **304** are connected to PCI local bus **306** through PCI bridge **308**. PCI bridge **308** also may include an integrated memory controller and cache
20  memory for processor **302**. Additional connections to PCI local bus **306** may be made through direct component interconnection or through add-in boards. In the depicted example, local area network (LAN) adapter **310**, SCSI host bus adapter **312**, and expansion bus interface **314** are
25  connected to PCI local bus **306** by direct component connection. In contrast, audio adapter **316**, graphics adapter **318**, and audio/video adapter **319** are connected to PCI local bus **306** by add-in boards inserted into expansion slots. Expansion bus interface **314** provides a connection
30  for a keyboard and mouse adapter **320**, modem **322**, and additional memory **324**. Small computer system interface (SCSI) host bus adapter **312** provides a connection for hard

disk drive **326**, tape drive **328**, and CD-ROM drive **330**.
Typical PCI local bus implementations will support three
or four PCI expansion slots or add-in connectors.

5    An operating system runs on processor **302** and is used
to coordinate and provide control of various components
within data processing system **300**.  The operating system
may be a commercially available operating system, such as
Windows 2000, which is available from Microsoft
Corporation.  Instructions for the operating system and

10   applications or programs are located on storage devices,
such as hard disk drive **326**, and may be loaded into main
memory **304** for execution by processor **302**.

Those of ordinary skill in the art will appreciate
that the hardware in **Figure 3** may vary depending on the

15   implementation.  Other internal hardware or peripheral
devices, such as flash ROM (or equivalent nonvolatile
memory) or optical disk drives and the like, may be used
in addition to or in place of the hardware depicted in
**Figure 3**.  Also, the processes of the present invention

20   may be applied to a multiprocessor data processing
system.

As another example, data processing system **300** may
be a stand-alone system configured to be bootable without
relying on some type of network communication interface,

25   whether or not data processing system **300** comprises some
type of network communication interface.  As a further
example, data processing system **300** may be a personal
digital assistant (PDA) device, which is configured with
ROM and/or flash ROM in order to provide nonvolatile

30   memory for storing operating system files and/or
user-generated data.

The depicted example in **Figure 3** and above-described

examples are not meant to imply architectural
limitations.  For example, data processing system **300**
also may be a notebook computer or hand held computer in
addition to taking the form of a PDA.  Data processing

5    system **300** also may be a kiosk or a Web appliance.

Turning next to **Figure 4,** a block diagram of a
browser program is depicted in accordance with a
preferred embodiment of the present invention.  A browser
is an application used to navigate or view information

10   or data in a distributed database, such as the Internet
or the World Wide Web.  In these examples, browser **400**
may be located on a data processing system, such as data
processing system **300** in **Figure 3.**

In this example, browser **400** is a talking Web

15   browser, which may be implemented using the Home Page
Reader (HPR), which is available from International
Business Machines Corporation (IBM).  The processes of
the present invention may be implemented within HPR.

As illustrated, browser **400** includes a user

20   interface **402**, which includes both a graphical user
interface (GUI) and a "visually impaired interface".  The
GUI allows a normal user to interface or communicate with
browser **400**, while the visually impaired interface
provides a means for a visually handicapped user to

25   navigate a Web page.  This visually impaired interface
includes an interface that will speak to a user as well
as recognize voice commands and command input from a
keyboard.  This interface provides for selection of
various functions through menus **404** and allows for

30   navigation through navigation **406**.  For example, menu **404**
may allow a user to perform various functions, such as
saving a file, opening a new window, displaying a

history, and entering a URL.  Navigation **406** allows for a
user to navigate various pages and to select Web sites
for viewing.  For example, navigation **406** may allow a
user to see a previous page or a subsequent page relative
5    to the present page.  Preferences such as those
illustrated in **Figure 4** may be set through preferences
**408**.

Communications **410** is the mechanism with which
browser **400** receives documents and other resources from a
10   network such as the Internet.  Further, communications
**410** is used to send or upload documents and resources
onto a network.  In the depicted example, communication
**410** uses HTTP.  Other protocols may be used depending on
the implementation.  Documents that are received by
15   browser **400** are processed by language interpretation **412**,
which includes an HTML unit **414** and a Java Script unit
**416**.  Language interpretation **412** will process a document
for presentation on graphical display **418**, as well as
through text-to-voice unit **420** for visually impaired
20   users.  In particular, HTML statements are processed by
HTML unit **414** for presentation while Java Script
statements are processed by Java Script unit **416**.

The processes of the present invention may be
implemented within language interpretation **412** to
25   identify salient features in a document.  Salient
features may include, for example, bold text, italicized
text, underlined text, text in a selected color, and text
having a certain font size.  When implemented within
language interpretation **412**, these features are extracted
30   from the document for presentation to a visually impaired
user.  This presentation may take the form of an audio
presentation of the summary or a physical tactile

presentation, such as generating a Braille version of the summary.

Graphical display **418** includes layout unit **422**, rendering unit **424**, and window management **426**. These

5 units are involved in presenting Web pages to a user based on results from language interpretation **412**.

Browser **400** is presented as an example of a browser program in which the present invention may be embodied. In this example, browser **400** may be used by both normal

10 and visually impaired users. Browser **400** is not meant to imply architectural limitations to the present invention. Presently available browsers may include additional functions not shown or may omit functions shown in browser **400**. A browser may be any application that is

15 used to search for and present content on a distributed data processing system. Browser **400** may be implemented using known browser applications with the processes of the present invention embodied within it. Such applications include, for example, Netscape Navigator,

20 Microsoft Internet Explorer, and Home Page Reader. Netscape Navigator is available from Netscape Communications Corporation while Microsoft Internet Explorer is available from Microsoft Corporation.

Browser **400** will parse a Web page to select salient

25 features indicted in the Web page through the RDF or other XML-based resource description file, such as an XML schema. These salient features will be presented to the user. XML based markup in the Web page may be used as an annotation. This markup can then be used to reference

30 the corresponding XML-based resource description file that many indicate the item is a salient feature. The salient feature provides a quick overview of the Web

page.

Turning next to **Figure 5**, a diagram illustrating components used in presenting salient features of a document is depicted in accordance with a preferred embodiment of the present invention. In this example,
5   Web server **500** provides content to browser **502** and browser **504** through internet **506**. In particular, Web documents **508** may be sent to users at browser **502** and browser **504**. In these examples, browser **502** and browser
10  **504** may be implemented using a talking Web browser, such as browser **400** in **Figure 4**.

Salient features from a document may be presented each time a page in the document is to be presented at a browser, such as browser **502**. In one embodiment of the
15  present invention, the salient features are identified by Web server **500** and sent to the user at browser **502**.

In the depicted examples, in response to a user request from browser **502**, Web server **500** sends a document from Web documents **508** to Web browser **502** for
20  presentation. Each time a page from the document is to be presented to the user, Web server **500** identifies the salient content within that page and generates a RDF file **510** or XML tags **512** and sends the file or tags to browser **502** for presentation to the user. In these examples, the
25  presentation is in a nonvisual manner, such as an audio format or a tactile format. The tactile format may be implemented using a Braille system that generates the appropriate Braille characters based on the content received at browser **502**. After the salient features from
30  a page have been presented to the user at browser **502**, the user is given an option as to whether the entire page will be presented.

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Alternatively, the processes of the present invention may be implemented within browser **502** or another program in a data processing system associated with browser **502**. In this implementation, the entire

5 document or a page of the document is received at browser **502** and analyzed to identify the salient features in the document or page. These identified salient features are then presented to the user.

Turning next to **Figure 6**, a flowchart of a process

10 used for presenting a document to a visually impaired user is depicted in accordance with a preferred embodiment of the present invention. The process illustrated in **Figure 6** may be implemented in the form of a set of computer code for use in a data processing

15 system. For example, the processes may be implemented as code for use in a proxy located at a server, a proxy located at the client on which the browser is executed, as a plug-in to a browser, or within a browser, such as browser **400** in Figure 4.

20 The process begins with the user specifying a URL at a talking Web browser (step **600**). Next, the browser contacts the Web server (step **602**). The browser fetches the whole file (step **604**). Then, the browser fetches any associated RDF/XML file (step **606**). An associated RDF or

25 XML file is present if the identification of salient features is provided by the Web server or a proxy server. One page of the document is displayed on a screen within the data processing system on which the talking Web browser is executing (step **608**).

30 A determination is then made as to whether the page is to be transcoded for a vision impaired user (step **610**). Step **610** determines whether salient features are

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to be identified. This identification may be made in various ways, for example, the user name and password in a message, an IP address, or a login mechanism may be used to determine whether a page is to be transcoded.

5  For example, the user name and password or IP address may be compared with a list or database of user name and passwords or IP addresses to identify whether the page is to be transcoded. If the page is to be transcoded for a vision impaired user, the page is transcoded (step **612**).

10  The transcoding process in step **612** is described in more detail in **Figure 7** below. The transcoding in these examples is performed on a page-by-page basis or by some other unit. For example, the unit for transcoding may be a percentage of the entire document or a displayable

15  portion of the document.

Next, a determination is made as to whether the next page is to be presented to the user (step **614**). If the next page is not to be presented to the user, the process terminates. Otherwise, the process returns to step **608**

20  as described above. With reference again to step **610**, if the page is not to be transcoded for a vision impaired user, the process proceeds to step **614**.

Turning next to **Figure 7**, a flowchart of a process used for transcoding a page is depicted in accordance

25  with a preferred embodiment of the present invention. The process illustrated in **Figure 7** may be implemented as computer code for software to provide transcoding functions to annotate content for salient features. This process is a more detailed description of step **612** in

30  **Figure 6** above.

The process begins by determining whether the user wants to hear salient features for the page or screen

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(step **700**). If the user wants to hear salient features for the page or screen, a determination is made as to whether XML tags or an RDF file has been received with the document (step **702**). If XML tags or an RDF file is

5 present, the talking Web browser reads or audibly presents the salient features (step **704**). Next, a determination is made as to whether the user wants to hear the contents of the page or screen (step **706**). If the user does want to hear the contents of the page or

10 screen, the audio browser reads the contents of the page or screen (step **708**) with the process terminating thereafter. Turning back to step **706**, if the user does not want to hear the contents of the page or screen, the process terminates.

15    With reference again to step **702**, if XML tags or an RDF file are absent, the talking Web browser parses the page or screen for salient features (step **710**) with the process then proceeding to step **704** as described above.

With reference again to step **700**, if the user does

20 not want to hear the salient features of the page or screen, the process proceeds to step **706**.

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary

25 skill in the art will appreciate that the processes of the present invention are capable of being distributed in the form of computer instructions forming a computer program in which these instructions may be embodied on various computer readable media. The present invention

30 applies equally regardless of the particular type of signal bearing media actually used to carry out t he distribution. Examples of computer readable media

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include recordable-type media, such as a floppy disk, a
hard disk drive, a RAM, CD-ROMs, DVD-ROMs, and
transmission-type media, such as digital and analog
communications links, wired or wireless communications

5    links using transmission forms, such as, for example,
radio frequency and light wave transmissions.  The
computer readable media may take the form of coded
formats that are decoded for actual use in a particular
data processing system.

10    The description of the present invention has been
presented for purposes of illustration and description,
and is not intended to be exhaustive or limited to the
invention in the form disclosed. Many modifications and
variations will be apparent to those of ordinary skill in

15    the art.  The depicted examples illustrate the
presentation of salient features in documents in the form
of Web pages.  The present invention may be applied to
other types of documents other than Web pages.  For
example, these processes may be applied to traditional

20    word processing documents.  Further, although the
illustrated example provides an audio presentation of
salient features, other mechanisms may be used to present
these salient features to a visually impaired user.  For
example, a tactile format using Braille may be employed

25    to present the salient features.  Additionally, the
presentation of the salient features may take other forms
to aid users who are not visually impaired.  For example,
the salient features may be highlighted.  The embodiment
was chosen and described in order to best explain the

30    principles of the invention, the practical application,
and to enable others of ordinary skill in the art to
understand the invention for various embodiments with
various modifications as are suited to the particular use

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contemplated.